PCT/GB2003/001645

INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 4 June 2003

Patents Form 1/77
Patents Act 1977
(Rule 16)

The Patent Office

22APR02 E712587-1 D02611
P01/7700 0.00-0209021.5

Request for grant of a patent

The Patent Office
Cardiff Road
Newport
South Wales NP10 8QQ

19 APR 2002

1. Your reference
5420501/IM

2. Patent Application Number
0209021.5

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Intersolve Limited
Ash House
Fairfield Avenue
Staines
Middlesex
TW18 4AN

8367369001

Patents ADP number *(if known)*

If the applicant is a corporate body, give the country/state of its incorporation — Country: **United Kingdom**

4. Title of the invention

ELECTRONIC PROCESSING SYSTEM

5. Name of agent — **Beresford & Co**

"Address for Service" in the United Kingdom to which all correspondence should be sent

2/5 Warwick Court
High Holborn
London WC1R 5DH

Patents ADP number

1826001

6. Priority details

Country	Priority application number	Date of filing

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier application | Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?

YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form	0
Description	60
Claim(s)	14
Abstract	0
Drawing(s)	7+7

10. If you are also filing any of the following, state how many against each item.

Priority documents	0
Translations of priority documents	0
Statement of inventorship and right to grant of a patent *(Patents form 7/77)*	1 + 2 copies
Request for preliminary examination and search *(Patents Form 9/77)*	0
Request for Substantive Examination *(Patents Form 10/77)*	0
Any other documents *(please specify)*	0

11. I/We request the grant of a patent on the basis of this application

Signature BERESFORD & Co Date 19 April 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Ian MacKenzie

Tel: 020 7831 2290

ELECTRONIC PROCESSING SYSTEM

The present invention concerns an electronic data processing system for facilitating the simultaneous management of Assets and Liabilities.

Financial markets are now extremely sophisticated as it is possible for individuals and companies to hold assets selected from a wide range of financial products the value of which can vary from day to day. The present invention concerns itself with those Assets the values of which are determined by movements in a Price Index. In this specification such assets are always written with a capital "A".

In this specification a Price Index is an index of prices where such prices are linked to the price of a commodity, share or any other type of asset or any index of prices of or derivative on such assets or a combination thereof. An example of a Price Index is one linked to a Stock Exchange Equity Index such as one based on the total stock market return including dividends. It will be appreciated that as well as there being an almost limitless number of Price Index links, the exposure to the Price Index of an Asset linked to that particular Price Index is capable of variation, for example being

more or less than 100% of the appropriate Price Index movement (this is known as the Gearing to the Price Index) and such Gearing might also be applied to Price Index movements above and/or below certain percentage levels.

The present invention concerns itself with those Liabilities that comprise one or more loans whose repayments to the lender can generate Assets.

The present invention is particularly concerned with the problems which arise if it is wished to manage the Net Position. Net Position is defined as Liabilities less Assets or Assets less Liabilities. Liabilities less Assets is hereinafter called Net Liabilities.

The daily or even more frequent management of such Net Positions can prove to be both onerous and difficult, particularly for relatively unskilled administrative staff.

In contrast the operation of standard repayment loans is well known. Thus an initial capital sum advanced to the borrower is repaid over a period of years by regular payments which are used firstly to meet interest charges

and secondly to make reductions in the initial capital sum. A relatively low grade clerical worker can process the requirements of such loans with ease.

Thus the main transactions under a standard repayment mortgage can be set out as follows:-

Firstly, the lender makes a mortgage loan to a borrower. This is the initial Capital Balance Outstanding and also the initial Redemption Amount. The Capital Balance Outstanding is the amount of the loan at any time upon which interest accrues. The Redemption Amount is the sum necessary to be paid by the Borrower to the Lender at any time to discharge all and any remaining liability under the mortgage excluding any redemption penalties or unpaid accrued interest.

Secondly the borrower at regular intervals pays interest based upon the Capital Balance Outstanding and the period since it was last paid. Borrower payments made in excess of the interest due are called Capital Payments and are used to repay part of the loan so that both the Capital Balance Outstanding and the Redemption Amount are reduced at each payment. Clearly the Capital Balance Outstanding and Redemption Amount are always identical excluding any

redemption penalties and unpaid interest due. The above steps are repeated over the duration of the loan until the Redemption Amount is reduced to zero.

It will be appreciated that the lender may make further advances to the borrower before the Redemption Amount is reduced to zero so that the Capital Balance Outstanding and the Redemption Amount will be increased by the amount of the further advance.

Although standard repayment mortgages are normally paid on a regular monthly basis it is of course possible for the borrower to make interest/capital payments on a regular and/or ad hoc basis. Finally the amount due from the borrower to the lender upon early redemption, in the absence of any other penalty charges is the Redemption Amount plus any outstanding interest due but not paid.

However it must be appreciated that any of the above procedures are relatively simple as any system dealing with such a mortgage is only concerned with the liability situation.

It has long been appreciated that the performance of the stock markets (as one example of a basis for a Price

Index) has historically been better than interest based assets such as deposits or bonds. Thus meeting a Liability by utilising repayments partly or wholly linked to an appropriate Price Index is likely to give long term benefits. Such a loan will be referred to as an Index Loan which may be offered to interested borrowers. However, creating exposure to a Price Index on a regular basis, as required for Index Loans, would raise a complex set of problems in a market such as the mortgage market where the Net Position has always to be taken into account. For example in the mortgage market lenders issue in the UK some 1.5 million mortgages a year with a total value of approximately £1,450,000,000. Thus the handling on such a scale of Net Liabilities linked to Price Index movements which are potentially volatile can cause major problems to administrators and managing ones Net Position would also be beyond the capability of all but the most financially sophisticated borrowers. In particular it is important that the clerical staff administrating such Index Loans can readily compare the necessary balance between Liabilities and Assets and also make alterations to the investment profiles such as changes of Price Index. The only practical manner in which this can be achieved is through the development of a new dedicated computer system.

In one aspect the present invention provides a computer system for managing Net Position, Assets and Liabilities, the system comprising:

an input unit, a memory unit, a display unit and a digital processing unit, wherein said memory unit includes:

a liability file having a plurality of storage areas for storing the amounts of a plurality of Liabilities in response to user input;

a liability interest rate file having a plurality of areas for storing in response to user input present and, if different, past interest rates applicable to said Liabilities;

an accrued interest file having a plurality of storage areas for storing data relating to the amounts of interest accrued on each of said Liabilities;

a paid interest file having a plurality of storage areas for storing data relating to amounts and dates of any interest paid in respect of individual ones of said Liabilities;

a payment file having a plurality of storage areas for storing data relating to payments made that create exposure to a Price Index, each payment being related to one of said Liabilities;

a Price Index file having a plurality of storage areas for storing in response to user input data identifying at least one Price Index;

a Price Index exposure file having a plurality of storage areas for storing user input data defining the degree of exposure of a payment to a selected Price Index;

a Price Index price file having a plurality of storage areas for storing in response to user input the data relating to the historic prices of the or each one of said Price Indices stored in said Price Index file;

a Price Index transactions file having a plurality of storage areas for storing data relating to the amount of transactions that create or reduce exposure to any Price Index where such transactions are in respect of a particular one of said Liabilities, the date of the transaction; and

a Review Basis file having a plurality of storage areas for storing in response to user input data defining the assumptions made with regard to the future performance of the or each of said Price Indices; and

wherein said digital processing unit comprises first processing means for calculating the total amount of each Liability from data stored in said liability file;

second processor means for calculating accrued interest for each Liability from data stored in said accrued interest file;

third processor means for calculating the value of transaction linked to a Price Index and associated with a Liability in response to data stored in said Price Index price file and said Price Index transactions file;

fourth processor means for calculating for each Liability the actual Net Liability from data stored in said Liability file said accrued interest file, said paid interest file, said payment file and said Price Index transaction file;

fifth processor means for reading in response to an output command entered through said input unit, data

generated by said fourth processor means; and

sixth processor means for generating in response to an output command a display of the Net Liability situation of a selected Liability and its associated Assets.

In order that the present invention may be more readily understood an embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 shows a network incorporating an electronic data processing system according to the present invention;

Figure 2 is a block diagram of the hardware of an electronic data processing system in accordance with the present invention;

Figure 3 is a table setting out software which can be used in the system of Figure 2;

Figures 4A and 4B show example screens which in the present embodiment are generated by the electronic data processing system of Figures 1 and 2; and

Figures 5 is a flow diagram of processing carried out in the system of Figure 1.

The embodiment to be described herein is directed to the management of Index Loans.

With regard to the present invention and the embodiment shown in the accompanying drawings the data processing system is for the management of Index Loans such as mortgages on a similar basis to repayment mortgages but with the additional complication that the repayment of the Index Loan is selectively linked to one or more Price Indices so that the Capital Balance Outstanding remains the same until either redemption occurs or further advances are made or repayments of capital are made . There is thus an increasing exposure to a Price Index generated by the positive payments made by the borrower. However, whilst with a standard repayment loan it is easy to predict funding requirements even given variable interest rates as these are always known in advance this is not possible with an Index Loan for reasons which will become apparent.

As already stated with a standard repayment loan it is simple to calculate future requirements as interest rates

are known in advance so that if there is an interest rate change it is simple to make the necessary adjustments either to the term of the loan or to the necessary increased repayments required to meet increased interest changes or reduced payments to meet interest rate reductions.

However, Price Index volatility is such that in order to set the terms of a new Index Loan it is necessary for assumptions to be made with regard to future Price Index movements for the Price Index links of Price Index exposure created by future payments made in respect of the Index Loan in order to try and ensure that the Liabilities are likely to be met at the end of the proposed term of the loan. It will be appreciated that as forecasting of such Price Index movements is by no means an accurate science it is also important to be able to respond appropriately to the history of the movements of the Price Index used during any period of the loan if the Price Index changes have been either favourable or unfavourable. Once again it has to be emphasised that it is not possible for a normal worker to be able to respond in such a manner without a new dedicated computer system.

As will become apparent the effect of the linkage with the or each Price Index can be considered as either affecting the interest payable or the Redemption Amount or a combination of both. The resulting overall effect will be the same, but because of the additional choice factor the management of the Net Liability situation remains ~~very complex. In~~ particular, the effect of the linkage of regular payouts to at least one Price Index means that due to the volatility involved it is very difficult for both the lender and the borrower to calculate at any one instant not just the current Net Liability situation but also to try and estimate the progress of the Net Liability in the future. The present invention is also concerned with providing a solution to this problem.

Referring now to Figure 1 of the accompanying drawings this shows a main processor or server at 1 linked by appropriate lines such as a fast LAN to co-servers 2_1, 2_2, 2_3, 2_4, ... 2_n and to processors 3_1, 3_2, 3_3, 3_4, ...3_n. Naturally the provision of co-servers and additional processors will depend on the number of mortgages being administered. Associated with the main processor 1 are printers 4 for generating reports, letters and the like together with additional back up equipment 5.

External connections are generally indicated at 6 so that the main processor can communicate via data links 7 and 8 to obtain interest rates and stock market information as well as the banking system to process regular payments such as direct debits.

The external connection may also include a connection 9 for linking the system to the Internet.

Finally the main processor can be connected to the or more lender terminals 10_1, 10_2, 10_3 .....10_n via the fast LAN network.

It is of course possible for the fast LAN network to be replaced by the Internet. However, given the nature of the present invention security reasons however mean that it is likely that a non-public network will be preferred for organisations involved in the management of multiple individual Net Liability situations.

Referring now to Figure 2 of the accompanying drawings this shows the main structure elements of the main server 1 and of a client terminal 10_n linked by a FAST LAN on TCP/P indicated at 11. The server 1 comprises a processor 12 such as a main frame computer. It has a

main memory 13 having storage areas DB1 to DB20 for storing an equivalent number of database files which will be described in greater detail hereinafter. Also provided in the main are storage areas for a plurality of routines R1 to R11. The processor is provided with secondary storage in the form of a secondary memory 14 for holding temporary files during operation. The server 1 also includes a display 15 which is optional as the important displays will be those seen by users of the system at, for example, terminals 10, ... At 16 the server includes input devices 16 which can comprise one or more keypads, interfaces for receiving inputs from one or more other networks and a reader such as a hand disc drive for receiving data from an appropriate storage medium such as a hard disc.

Finally the server includes the appropriate interface circuit 17 by means of which it can communicate with the Network 11. Turning now to the terminal 10 this has a network interface 18 for enabling communication with the network 11, a central process 19 connected to a display 20, at least one input device in the form of a key pad 21 and main and secondary memories 22 and 23. The main memory 22 includes storage areas for storing a plurality of standard routines used by a clerical worker to call

up appropriate data from the main server so that the situation of any borrower can be displayed by the use of appropriate display driver circuitry shown at 23. Naturally the terminal can be linked to a printer or other hard copy device.

There will now be given a more detailed description of the databases DB1 to DB20. As the present embodiment is for the management of Index Mortgages not all of these databases are essential if the Liability is not a mortgage. It will also be appreciated that many of the database files are for user input and are not data specific.

Thus database DB1 comprises storage areas for storing a Personal Detail file in response to user input. Thus this database stores the necessary personal details of each borrower whose Net Liability position is being managed. The data stored in this database is input by the user via one of the input devices 16. The second database DB2 is optional and comprises storage areas for filing a Third Party Detail file which includes relevant third party details such as those relating to estate agents or solicitors associated with the Liability. Again this data is input by the user. Database DB 3 is

a storage area which stores a Product file holding data which the fundamentals represents rules which govern each loan as these of course can be varied, again at the user's choice. However the most important product rules can be summarised as follows:

1) Interest calculation method.

2) Redemption penalties.

3) Terms of any special interest rate details.

Database DB4 is again a storage area for storing a Mortgage Interest Rate file input by a user and representing the interest rates payable on each loan and the dates over which the interest rates payable on each loan and the date from which the interest rates were applicable. Once again this data is user specific.

Database DB5 is a storage area for storing a Payment Allocation file which holds data relating to the allocation of a payment made by a borrower between Capital, Interest and to one or more Price Indices together with the relevant dates at which the allocations were made and the amounts of the allocation. This data

is initially user input but is also involved in routine R8 which will be described hereinafter.

Database DB6 is a storage area for storing a Price Index Links file which holds details of each Price Index which is associated with a Liability together with the payment type and relevant dates. Once again the initial date is in user input. The date stored in database DB6 is used in routine R9 as will be described hereinafter.

Database DB7 is a storage area which stores in response to user input a Price Index Prices file which holds the actual prices of the or each relevant Price Index and the dates at which those prices applied. This data is also user input.

Database DB8 is a storage area for storing a Review Basis file in response to user input. This important file holds the assumptions of Price Index movement under which the initial terms of the loan agreement were set as well as alterations to these assumptions made during the term of the loan. Thus the data comprises:

1) The outstanding term at the end of which the objective is that the Net Liability is less than or

equal to zero.

2) The frequency of future Payments that will be exposed to a Price Index.

3) The exposure amount of Payments associated with each Liability to a selected Price Index on Indices.

4) The assumption of future Price Index movements.

5) The current Net Liability.

Database DB9 is for storing a Price Index exposure file which stores in accordance with user exposure rules and the dates under which allocated amounts of Payments are allocated to a Price Index. The basic data is user input and is utilised in routine R9 to be described hereinafter.

Database DB10 is a storage area for storing a Borrowings Transaction File representing the amounts of borrowings or loans and the dates when such borrowings or loans paid to each borrower. Such borrowing or loan is held under a Liability that has a unique code associated with it.

Database DB11 is for storing data relating to regular payments by the borrower and involved both user input and routine R8.

Database DB 12 is a storing area for storing an accrued interest file, the Accrued Interest being the interest which has accrued on each Liability and includes penalty interest (if any) and the relevant dates. This file is used in routine R2 to be described hereinafter.

Database DB13 is a storage area for storing data relating to Paid Interest on each Liability which also includes the amount and data of such Payments and is used in routine R2 to be described hereinafter.

Database DB14 is a storage area for storing transaction details including the transaction amounts, dates and type of transaction in response to user input and also for use in routine 3 and in routine 10 which will be described hereinafter. Data can also be stored in this file from an externals source such as a bank into which payments have been made. Thus such payments can be entered via BACS.

Database DB15 is a storage area for storing a Price Index

Transactions file comprising data representing each Price Index transaction including the unit amount of the transaction, the data of the transaction and the Price Index involved. This data is used in routines R3 and R9. The term "unit amount" will be defined in the description of routine 3.

Database DB16 is a storage area for storing a Corporate Transaction file. The presence of this database is optional as its contents represent, for example, commission payments to third parties and the dates of such payments. This data is user specific and is used in routine R7 to be described hereinafter.

Database DB17 is a storage area for storing a Net Liability file the contents of which represents the Net Liability of each Liability managed by the system. The contents of this file are used in routines 1, 4 and 5 to be described hereinafter.

Databases DB18, DB19 and DB20 are storage areas for storing a respective letter file, standard internal report file and a client statement file. Databases DB18 and DB20 have user input and all three files are used in routine R11 to be described hereinafter.

It will be appreciated that it is possible to organise the databases just described in other ways by either amalgamation or subdivision.

For example databases 11 and 14 could be amalgamated. Additionally it is only for convenience that database DB17 exists as this value can readily be generated on demand for display from data already present in databases DB1, DB14 and DB15.

As will be described the data processing system of Figures 1 and 2 carries out in response to stored routines seven main process steps in response to data stored in the data bases shown in Figure 2:

These processing steps are:

1. Calculating Accrued Interest.

2. Collecting Payments (automated for regular payments and manual for ad hoc payment) and allocating them as various types of transaction and making payments to the borrower.

3. Generating transactions between the lender and

various third parties. These would include payments to funding sources, fees to packagers, commission to brokers etc. Under an Index Loan there are, at the lender's discretion, some possible additional payments, for example a commission based upon the value of the Assets.

4. Switching the Price Index links either of current Price Index exposure or that which will be created by future payments.

5. Carrying out Reviews. This is the process of reviewing how the value of the Net Liability is proceeding against plan and whether any change up or down to the regular payment level is required. This is specific to an Index Loan. The purpose of Reviews is to help ensure that the Price Index exposure by future payments is set to the "best" level. In this case best means that according to the assumptions made the currently proposed future Price Index exposure amounts are within the tolerance levels of the required amount that the Review process calculates. A small part of this process is taken up with the interest element of any regular payments made by the borrower. This

occurs with all mortgages and is a matter of comparing cumulative interest paid to cumulative accrued interest. The main part of the Review process is thus taken up with determining what the theoretically required Price Index exposure per regular payment is, on the current set of assumptions. A review and possible change of these assumptions is also part of the Review process and to compare the result to the current exposure amount and the acceptable tolerance between the two as set out as part of the Review assumptions. Calculating the theoretical Price Index exposure amount requires the calculation of an accumulation factor which will be defined hereinafter and which requires a future Price Index growth assumption. The Review process may cause this assumption to be revised from time to time. Deducting the current value of Assets from the current Total Borrowings equals the Net Liability and the amount needed currently to redeem the Index Loan (excluding any outstanding unpaid interest and/or redemption penalties). The projected future value of the current value of Assets plus the accumulated value of future proposed Price Index exposure amounts must between them at least equal the current

Liabilities if the Index Loan is to be repaid by a particular date.

6. Maintaining a database of Price Index movements

7. Carrying out redemption checks. When the Net Liability is first less than or equal to zero the system will create a warning flag and possibly automated Index Loans redemption processing.

There will now be given a description of routines R1 to R11 which are invoked to carry out the above main process steps.

Thus routine R1 is used to calculate Total Borrowings and is carried out whenever routines R2, R6, and R8 are to be run and when those items in routine 11 involve or require an up to date Total Borrowings number or a User requires such, for example upon a request for this information submitted by a client.

The routine involves summing all transactions for a particular mortgage code that appears in DB10 (which means they are Borrowing transactions by definition) and summing all transactions of the Repaid Borrowing type

(whether such transactions arose from Ad Hoc Payments or Regular Mortgage Payments) for the same mortgage that appear in DB14 in order to calculate the Total Borrowings at the calculation date.

The result, and calculation date, is sent to DB17. This routine is similar to S11 in Diagram 5.

Note that Repaid Borrowing transactions in DB14 are held as opposite sign to the Borrowing transactions in DB10.

Routine R2 is carried out according to the user defined product rules stored in database DB3 as to when changes to Total Borrowing affects the accrual of interest due from the borrower and is also required whenever routine 3 is to be run and the payment processed by it is to include an element for DB 13 or routine R6 is to be run or a User requires the information.

The routine determines the Accrued Interest for a particular Index Loan since the routine was last run. It will be necessary to subdivide this period if the interest accrual rate and/or the Total Borrowings upon which interest accrues changed during the period. The routine will determine such sub-periods using the rules

of DB3 and the data in DB4 and DB10, collecting also the appropriate interest rate(s) from DB4 and applying them according to the rules of DB3 to the applicable Total Borrowing collected from DB17 for the relevant sub-period.

The result for each sub-period, and the sub-period's calculation date is sent to DB12.

Routine R3 is carried out either when a User instructs the system that a Payment (Regular Mortgage Payment or Ad Hoc Payment) has been received or that a Positive Advance is to be made or when the system has been scheduled that a Regular Mortgage Payment is due. In this case it is assumed that if such a scheduled due payment does not occur then routine R10 will pick this up and create the necessary opposite payment transaction(s) to neutralise the results of this routine. It is alternatively possible to set the system so that this routine is only activated for scheduled due payments once routine 10 has confirmed their receipt.

The routine involves allocating any Payments made or falling due since the last time it was run between Interest (to become Paid Interest), Capital (Repaid

Borrowing) and Index (to contribute to Price Index Value) according to the rules contained in DB3. For example if Accrued Interest exceeds Paid Interest does any particular type of payment have to have any specific allocation that would override the normal allocation rules of DB5. The rules in DB3 may require data from database ~~DB12 & 13 to be summed as part of the routine~~ as already noted. Any Index amounts will be converted by the routine into units of specific Price Indices according to the relevant Price Index links that apply from DB6 and Price Index exposure rules of DB9, dividing the result by the relevant Price Index price from DB7 in order to arrive at the Unit Amount.

For Positive Advances (PA) the routine will execute the payment according to User input, either to the client by cheque or direct via the banking system and database update DB14 with this information or apply it as a Repaid Borrowing and update DB15 with this information. This updating will comprise a negative unit transaction for one or more Prices Indices where the sum of each unit transaction when each is first multiplied by the relevant price of the Price Index equals the payment amount.

The Interest result, and calculation date, is sent to

data DB13.

The Interest and Capital results, and calculation date, are sent to database DB14.

The Price Index unit amount, results, and calculation date, is sent to database DB15.

Routine R4 is carried out when routines R6 to R8 are to be run. It also may be used in routines R7, R9 and R11 or at the request of the User.

The routine sums all unit transactions in database DB15 separately for each Price Index, multiplies each such sum by the price of the relevant Price Index for the calculation date from database DB7 and sums the results.

The result, and calculation date, is sent to database DB17 with opposite sign to that with which Total Borrowings (TB) are sent to database DB17 under routine R18.

Routine R5 is used to calculate Liabilities other than Total Borrowing and is carried out if routine R6 is to be run or according to a User defined schedule or rules.

Database DB17 will already contain Total Borrowings as a result of routine 1 and Price Index Value from routine 4 as at the date this routine is working to. This routine calculates final items that routine R6 will require, namely any Redemption Penalties and any Outstanding Interest.

Redemption Penalties are calculated by the routine based upon the rules in database DB3 and are simply those amounts defined in the product code that apply at any given date to the Borrowings data from database DB17 if Total Borrowings are to be repaid in part or in whole.

Outstanding Interest is calculated as the Accrued Interest less Paid Interest (summed from databases DB12 & 13 respectively to the same date this routine is using and in accordance with the rules in database DB3 if these apply).

The results, and calculation date, is sent to update database DB17.

Routine R6 is carried out according to a User defined schedule or rules, or upon User request.

Thus the variables are defined as follows:

${}_tTB$ = Total Borrowings (cumulative) at time t
Total Borrowings comprise Borrowings (any sums lent by the lender to the borrower, that are not drawn against the Index Bonus and thus create an interest due and capital repayment liability upon the borrower), less any Repaid Borrowing (any sum paid by the borrower to the lender that the borrower elects to be used to repay sums lent)

${}_tB$ = Borrowings, if any, made at time t by the lender

${}_tRB$ = A Repaid Borrowing, if any, made at time t by the borrower. A Repaid Borrowing can be made either as part of a Regular Mortgage Payment or as part of an Ad Hoc Payment

$${}_tTB = \sum_{i=0}^{t} {}_iB - {}_iRB$$

${}_tRB2$ = A Repaid Borrowing, if any, made at time t by the borrower that was part of an Ad Hoc Payment

$${}_tTB2 = \sum_{i=0}^{t} {}_iB - {}_iRB2$$

${}_tRA$ = Redemption Amount at time t

$${}_tRA = {}_tTB - {}_tIB$$

${}_tIB$ = Index Bonus at time t summed for all Price Indices

${}_tIB_j$ = Index Bonus at time t arising from Price Index j only

$${}_tIB = \sum_{j=1}^{X} \sum_{i=1}^{t-1} {}_iIA_j \times \{ {}_tPI_j / {}_iPI_j - \prod_{k=i+1}^{t} (1 + {}_kINT) \} + \{ {}_iAHNA_j \times {}_tPI_j / {}_iPI_j - {}_iPA_j \times {}_tPI_j / {}_iPI_j \}$$

${}_tINT$ = interest rate % that applies to the mortgage at time t so that it is the rate used in the calculation of interest due between the periods t-1 and t. For definition purposes let this rate be defined as an APR (Annual Percentage Rate which is a standardised annual rate)

FP = the frequency of or time period between Regular Mortgage Payment (so FP = 12 implies monthly, 1 = annual etc). For simplicity it has been assumed that all such regular mortgage payments are indeed paid, each in arrears at the end of each such period, and that all other Ad Hoc Payments, Borrowings and Advances are also only made at such times, as are any interest rate changes. Time t is defined as the time when t of these periods have fully elapsed

${}_tRMP$ = Regular Mortgage Payment amount due at time t, a payment made by the borrower to the lender that is intended to be made regularly and, whilst conditions or Review assumptions do not change the total amount of each such payment is unchanged. There is no unique formulae or method for determining the level of Regular Mortgage Payment; indeed they could possibly be set to zero. One possible formulaic definition is as follows:

${}_tRMP = {}_tI + {}_tCA$

${}_tI$ = the Interest Cost Element of the Regular Mortgage Payment due at time t

${}_tI = \{ [(1 + {}_tINT)^{(1/FP)}] - 1 \} \times {}_{t-1}TB$

${}_tRB = {}_tCA + {}_tAHRB$

${}_tRB2 = {}_tAHRB$

${}_tCA$ = the Capital Amount paid at time t summed for all Price Indices, this is the element of ${}_tRMP$ that is not required to cover interest due at that time. This amount constitutes a Repaid Borrowing.

There is no unique formula or definition for this amount; it is simply the excess of the payment over the amount needed to meet the Interest Cost Element. However, if the objective at time t is that the Capital Amount of all remaining (N-t) x FP Regular Mortgage Payments will reduce current Total Borrowings to an amount that will exactly equal the projected Index Bonus amount at the end of the N x FP period, then the formula to determine the next required Capital Amount (${}_{t+1}CA$) is as follows:

${}_{t+1}CA = {}_tCA \times (1 + {}_{t+1}INT) + {}_{t+1}IA - {}_tIA + [\text{for } t>=2] \ ({}_{t+1}INT - {}_tINT) \times {}_{t-1}TCA$

where ${}_0IA = {}_0CA = 0$ and ${}_{t-1}TCA = \sum_{i=1}^{t-1} \sum_{j=1}^{x} {}_iCA_j$

Note that it is possible that there is no N, or the lender is expecting the borrower to find some or all of the Redemption Amount proceeds after N years from another source, in which case another method, or arbitrary judgement upon the part of the borrower or the lender, is used to determine the amounts ${}_tCA$ and/or ${}_tAHNA$ that are either required, appropriate or recommended.

${}_tIR$ = Index Repaid amount at time t, the accumulated value at time t of all Index Amounts (${}_tIA$) due plus the accumulated value of all Ad Hoc Negative Advances paid less the accumulated value of all Positive Advances taken

$${}_tIR = \sum_{i=1}^{t} \sum_{j=1}^{x} \{ {}_iIA_j \times {}_tPI_j / {}_iPI_j \} + \{ {}_iAHNA_j \times {}_tPI_j / {}_iPI_j \} - \{ {}_iPA_j \times {}_tPI_j / {}_iPI_j \}$$

${}_{t+1}IA = ({}_tTB2 - {}_tIR \times [(1 + {}_tG)^{(N \times FP - t)}]) / S_{(N-t)}$

N = planned mortgage term (in years)

$S_{(N-t)} = \{ [(1 + {}_tG)^{(N \times FP - t)}] - 1 \} / {}_tG$

$_tG$ = Price Index link growth rate % (applying to the period 1/FP) assumed by the lender at time t as applying on average to all the Price Indices that a borrower has selected or may select in the future

Reviews will affect $_{t+1}IA$ (as before) and will thus feed into $_{t+1}RMP$ via $_{t+1}CA$

PI = à Price Index

PI_j = Price Index j

$_tPI_j$ = the level of Price Index j at time t

Advances comprise:

a) Positive Advances which are any sums lent by the lender to the borrower that the borrower elects to be drawn against (i.e. deducted from) the Index Bonus, less
b) Negative Advances which are any sums paid by the borrower to the lender to increase the Index Bonus amount that were made as all or part of an Ad Hoc Payment (i.e. excluding the effect any Regular Mortgage Payments have on the Index Bonus amount)

$_tPA$ = a Positive Advance, if any, made by the lender to the borrower at time t summed for all Price Indices

$_tPA_j$ = the element of a Positive Advance made at time t that is exposed to Price Index j

$_tAHP$ = Ad Hoc Payment amount paid at time t by the borrower

$_tAHP = {}_tAHRB + {}_tAHNA$

$_tAHRB$= Ad Hoc Repaid Borrowing, the element of the Ad Hoc Payment paid at time t that is allocated to a Repaid Borrowing by the borrower

$_tAHNA$= Ad Hoc Negative Advance, the element of the Ad Hoc Payment paid at time t that is allocated to a Negative Advance by the borrower summed for all Price Indices

$_tAHNA_j$= the element of an Ad Hoc Negative Advance that is exposed to Price Index j

$_tA = {}_tPA - {}_tAHNA$

$_tAHNA = {}_tAHNA_1 + {}_tAHNA_2 + \ldots {}_tAHNA_X$ where $_tAHNA_j$ is that part of $_tAHNA$ that is exposed to Price Index j

$_tIA = {}_tIA_1 + {}_tIA_2 + \ldots + {}_tIA_X$ where $_tIA_j$ is that part of $_tIA$ that is exposed to Price Index j

$_tCA = {}_tCA_1 + {}_tCA_2 + \ldots + {}_tCA_X$ where $_tCA_j$ is that part of $_tCA$ that is exposed to Price Index j

$$ {}_tIR = \sum_{i=1}^{t} \sum_{j=1}^{X} \left\{ {}_iIA_j \times {}_tPI_j / {}_iPI_j \right\} + \left\{ {}_iAHNA_j \times {}_tPI_j / {}_iPI_j \right\} - \left\{ {}_iPA_j \times {}_tPI_j / {}_iPI_j \right\} $$

X = the number of Price Indices

Ignoring any redemption penalties or unpaid interest due, the Redemption Amount at time t = ${}_tTB - {}_tIR$.

It will be appreciated that this formula includes the effect of Positive Advances made by the lender to the borrower which are drawn against the Index Repaid. To exclude the effect of these advances the last term of the equation is to be omitted.

It is possible that ${}_tIA$ may be determined at the discretion of the lender or the borrower and that the Index Repayment Mortgage need not have a planned end date.

It may be required to calculate the equivalent interest

Page 42 follows

rate applying to a Repayment Mortgage that would have produced the same Redemption Amount as under a particular Index Repayment Mortgage.

There are a number of ways that such an equivalent interest rate may be defined by any User of the system, for example as the overall average interest rate. Taking this example, for any Index Repayment Mortgage and an $_tIR$ result at time t, one can calculate the rate of interest, call it $_tINTADJ$, that for a standard repayment mortgage with the same Borrowings, Repaid Borrowings, Negative and Positive Advances, and the same Regular Mortgage Payments as happened under the particular Index Repayment Mortgage, would have produced the same Redemption Amount (the amount needed to be paid by the borrower in order to redeem the mortgage in full at this time ignoring any redemption penalties or unpaid due interest).

The computer system will calculate $_tINTADJ$ according to the bespoke code for that User. The first step would be to determine what $_tRA$ (the Redemption Amount at time t under a standard repayment mortgage) would be using the same Borrowings, Repaid Borrowings, Negative and Positive Advances, Regular Mortgage Payments and Interest Rate as for the Index Repayment Mortgage.

$$ {}_{t}RA = \sum_{i=1}^{t} \left\{ \left[{}_{i}B - {}_{i}AHRB - {}_{i}RMP + {}_{i}PA - {}_{i}AHNA \right] X \left[\prod_{j=i+1}^{t} \left(1 + {}_{j}INT \right)^{\Lambda} (1/FP) \right] \right\} $$

If ${}_{t}RA$, on the assumptions of the previous paragraph, is greater than (${}_{t}TB$- ${}_{t}IR$) then the Price Index links selected have, overall, reduced the borrowers cost of borrowing. To find the equivalent overall repayment mortgage interest rate the processor can solve the above equation by replacing ${}_{j}INT$ with INT and solving for INT so that the right hand side equals ${}_{t}TB$ - ${}_{t}IR$.

It will accordingly be appreciated that in order to carry out the above functions the computer system of Figure 1 will carry out the following processing steps which are set out in the flow diagram of Figure 5 which represents the main processing normally carried out daily, at a time t.

Thus Figure 5 of the accompanying drawings is a flow diagram of the main daily operations carried out by the processing system of Figures 1 and 2.

In step S10 a check is made to determine whether or not an initial Borrowing, further Borrowing and/or Repaid

Borrowing has been made since the last processing. Naturally if the initial Borrowing has just been made the other values will be zero.

If the answer to this step is YES database DB10 and DB17 is updated in step S11. Step S12 follows the two previous steps and in this step database DB14 is checked to see if positive or negative advances have been made since the last processing. Again if this is the first processing the answer will always be NO but if the answer is YES databases DB14 and DB15 are updated in step S13. In step S14 the values of $_{t-1}TB$, $_{t}TB$, $_{t-1}IP$, $_{t}INT$, $_{t-1}AI$, $_{t-1}IA$, $_{t}AHNA$ and $_{t}PA$ are collected from the appropriate databases and in step S15 $_{t}AI$ is calculated using the appropriate formula and added to database DB12. $_{t-1}IP$ is the total interest paid by time t-1 and $_{t-1}AI$ is the total accrued interest at time t-1.

Step S16 represents the Payment Collection routine and in it a check is made if a regular payment has been made since the last processing. If the answer is YES $_{t}IP$ is deducted and allocated to database DB13 in Step 17 and the excess allocated to the databases DB14 and DB15 in Step S18. AI equals the accrued interest. Within preset tolerances AI should equal IP. In step S19 all IA, Price

Index prices, $_tIP$ and $_tAI$ are collected from the appropriate databases so that the system can calculate $_tIR$ in step S20. In step S20 $_tIR$ is calculated using the Index Amount IA, any positive or negative advances which have been made and the Price Index PI prices from which $_tTB - _tIR$ is calculated and database 31 updated.

In step S21 the system checks if the first calculated $_tIR$ is equal or not to $_tTB + _tAI - _tIP$ as held in databases 21 and 28 and if the answer is YES step S22 initiates an auto redemption process. If the answer is NO step S23 collects $_tG$ as part of the already described Review process and in step S24 the system calculates average historical $_tINT$, average historical $_tG$ and average historical PI prices using values from the appropriate databases. Step S25 continues the Review process so as to set $_tG$ and updates database DB8 in step S26.

In step S27 the system calculates S_{n-t} and its value is used in step S28 to calculate an initial value for $_{t+1}IA$ and the value so generated is used to check if $_{t+1}IA = _tIA$ in step S29. If the answer is NO the Review process is used to set a revised $_{t+1}IA$ and databases DB5 and DB6 are updated in step S30. If the answer to step S29 is YES or NO step S31 checks if $_tIP = _tAI$. If the answer to

this step is NO step S32 initiates a Review process to set a revised $_{t+1}I$ which is stored in database 22 in step S33. Step S34 sets $_{t+1}RMP$ using the previously calculated $_{t+1}IA$ and $_{t+1}I$.

Step S35 checks if any automatic switching of Price Indices is to be carried out. If a switch is required the appropriate databases DB6, DB9 and DB15 are updated for the next cycle.

It will be appreciated that the above described system keeps separate the Capital Balance Outstanding and the Redemption Amount. However, it is also entirely possible for the system described with minor changes to calculate the requirements of an Index Repayment mortgage when the Capital Balance Outstanding is reduced by part of each payment made by the borrower. As in the previous embodiment the variables to be calculated will now be defined.

$_tTB$ = Total Borrowings (cumulative) at time t

Total Borrowings comprise Borrowings (any sums lent by the lender to the borrower, that are not drawn against the Index Bonus and thus create an interest due and capital repayment liability upon the borrower), less any Repaid Borrowing (any sum paid by the borrower to the lender that the borrower elects to be used to repay sums lent)

$_tB$ = Borrowings, if any, made at time t by the lender

$_tRB$ = A Repaid Borrowing, if any, made at time t by the borrower. A Repaid Borrowing can be made either as part of a Regular Mortgage Payment or as part of an Ad Hoc Payment

$$_tTB = \sum_{i=0}^{t} {}_iB - {}_iRB$$

$_tRB2$ = A Repaid Borrowing, if any, made at time t by the borrower that was part of an Ad Hoc Payment

$$_tTB2 = \sum_{i=0}^{t} {}_iB - {}_iRB2$$

${}_tRA$ = Redemption Amount at time t

${}_tRA = {}_tTB - {}_tIB$

${}_tIB$ = Index Bonus at time t summed for all Price Indices

${}_tIB_j$ = Index Bonus at time t arising from Price Index j only

$$ {}_tIB = \sum_{j=1}^{x} \sum_{i=1}^{t-1} {}_iIA_j \, x \left\{ {}_tPI_j / {}_iPI_j - \prod_{k=i+1}^{t} (1 + {}_kINT) \right\} + \left\{ {}_iAHNA_j \, x \, {}_tPI_j / {}_iPI_j - {}_iPA_j \, x \, {}_tPI_j / {}_iPI_{jj} \right\} $$

${}_tINT$ = interest rate % that applies to the mortgage at time t so that it is the rate used in the calculation of interest due between the periods t-1 and t. For definition purposes let this rate be defined as an APR (Annual Percentage Rate which is a standardised annual rate)

FP = the frequency of or time period between Regular Mortgage Payment (so FP = 12 implies monthly, 1 = annual etc). For simplicity it has been assumed that all such regular mortgage payments are indeed paid, each in

arrears at the end of each such period, and that all other Ad Hoc Payments, Borrowings and Advances are also only made at such times, as are any interest rate changes. Time t is defined as the time when t of these periods have fully elapsed

$_tRMP$ = Regular Mortgage Payment amount due at time t, a payment made by the borrower to the lender that is intended to be made regularly and, whilst conditions or Review assumptions do not change the total amount of each such payment is unchanged. There is no unique formulae or method for determining the level of Regular Mortgage Payment; indeed they could possibly be set to zero. One possible formulaic definition is as follows:

$$_tRMP = {}_tI + {}_tCA$$

$_tI$ = the interest cost element of the Regular Mortgage Payment due at time t

$$_tI = \{ [(1 + {}_tINT)\,\hat{}\,(1/FP)] - 1 \} \times {}_{t-1}TB$$

$_tRB = {}_tCA + {}_tAHRB$

$_tRB2 = {}_tAHRB$

$_tCA$ = the Capital Amount paid at time t summed for all Price Indices, this is the element of $_tRMP$ that is not required to cover interest due at that time. This amount constitutes a Repaid Borrowing.

There is no unique formula or definition for this amount; it is simply the excess of the payment over the amount needed to meet the Interest Cost Element. However, if the objective at time t is that the Capital Amount of all remaining (N-t) x FP Regular Mortgage Payments will reduce current Total Borrowings to an amount that will exactly equal the projected Index Bonus amount at the end of the N x FP period, then the formula to determine the next required Capital Amount ($_{t+1}CA$) is as follows:

$$_{t+1}CA = {}_tCA\times(1+{}_{t+1}INT)+{}_{t+1}IA-{}_tIA+[\text{fort}>=2]\ ({}_{t+1}INT-{}_tINT)\times{}_{t-1}TCA$$

$$\text{where } {}_0IA = {}_0CA = 0 \text{ and } {}_{t-1}TCA = \sum_{i=1}^{t-1}\sum_{j=1}^{X} {}_iCA_j$$

Note that it is possible that there is no N, or the

lender is expecting the borrower to find some or all of the Redemption Amount proceeds after N years from another source, in which case another method, or arbitrary judgement upon the part of the borrower or the lender, is used to determine the amounts ${}_tCA$ and/or ${}_tAHNA$ that are either required, appropriate or recommended.

${}_tIR$ = Index Repaid amount at time t, the accumulated value at time t of all Index Amounts (${}_tIA$) due plus the accumulated value of all Ad Hoc Negative Advances paid less than the accumulated value of all Positive Advances taken

$$ {}_tIR = \sum_{i=1}^{t} \sum_{j=1}^{X} \{ {}_iIA_j x_t PI_j / {}_iPI_j \} + \{ {}_iAHNA_j x_t PI_j / {}_iPI_j \} - \{ {}_iPA_j x_t PI_j / {}_iPI_j \} $$

${}_{t+1}IA = ({}_tTB2 - {}_tIR x [(1 + {}_tG)\hat{}\ (N x FP - t)]) / S_{(N-t)}$

N = planned mortgage term (in years)

$S_{(N-t)} = \{ [(1 + {}_tG)\hat{}\ (N \times FP - t)] - 1 \} / {}_tG$

${}_tG$ = Price Index link growth rate % (applying to the period 1/FP) assumed by the lender at time t as applying on average to all the Price

Indices that a borrower has selected or may select in the future

Reviews will affect $_{t+1}IA$ (as before) and will thus feed into $_{t+1}RMP$ via $_{t+1}CA$

PI = a Price Index

PI_j = Price Index j

$_tPI_j$ = the level of Price Index j at time t

Advances comprise:

a) Positive Advances which are any sums lent by the lender to the borrower that the borrower elects to be drawn against (i.e. deducted from) the Index Bonus, less

b) Negative Advances which are any sums paid by the borrower to the lender to increase the Index Bonus amount that were made as all or part of an Ad Hoc Payment (i.e. excluding the effect any Regular Mortgage Payments have on the Index Bonus amount)

$_tPA$ = a Positive Advance, if any, made by the lender

to the borrower at time t summed for all Price Indices

$_tPA_J$ = the element of a Positive Advance made at time t that is exposed to Price Index J

$_tAHP$ = Ad Hoc Payment amount paid at time t by the borrower

$_tAHP = {}_tAHRB + {}_tAHNA$

$_tAHRB$ = Ad Hoc Repaid Borrowing, the element of the Ad Hoc Payment paid at time t that is allocated to a Repaid Borrowing by the borrower

$_tAHNA$= Ad Hoc Negative Advance, the element of the Ad Hoc Payment paid at time t that is allocated to a Negative Advance by the borrower summed for all Price Indices

$_tAHNA_j$= the element of an Ad Hoc Negative Advance that is exposed to Price Index j

$_tA = {}_tPA - {}_tAHNA$

$_tAHNA$= $_tAHNA_1 + _tAHNA_2 + \ldots _tAHNA_x$ where $_tAHNA_j$ is that part of $_tAHNA$ that is exposed to Price Index j

$_tIA$ = $_tIA1 + _tIA2 + \ldots +_tIAX$ where $_tIAj$ is that part of $_tIA$ that is exposed to Price Index j

$_tCA$= $_tCA_1+_tCA_2+\ldots+_tCA_x$ where $_tCA_j$ is that part of $_tCA$ that is exposed to Price Index j

GLOSSARY

Accrued Interest

Accrued Interest is the amount of interest that has accrued on an Index Loan since it started and is based upon the Index Loan interest rate and the level of Total Borrowings from time to time.

Assets (Asset)

An Asset or Assets can only be created by a payment made by the borrower of an Index Loan to the lender where such payment is requested by the borrower to create an exposure to the movements in one or more Price Indices by the borrower (the Payment creates an allocation to Index).

The value of Assets any time is determined solely by the sum of amounts allocated to Index after each such amount has had applied the relevant movement or movements in value of one or more Price Indices to it after such movement or movements have themselves had the appropriate Gearing factor applied. Where the term Price Index Value is used it refers to the value of Assets.

For the purposes of describing two possible product constructions of an Index Mortgage the terms Index Repaid

and Index Bonus are used and, in each case, these are the value of Assets.

Borrowings

The cumulative total of all capital or principal borrowed by the borrower from the lender to date under any one Index Loan is called Borrowings with each individual tranche of Index Loan borrowed called a Borrowing. Note that this excludes any repayments of capital - see Repaid Borrowings and Total Borrowings.

Gearing

This is the factor that is applied to Price Index movements, or set of factors applied to Price Index movements at specified levels. In the description of two possible product constructions of an Index Mortgage the Price Index levels are assumed to be after the Gearing factor or factors have been applied.

Index

This is the amount that is to be exposed to future movements of one or more Price Indices; such amount is created by the making of a Payment but does not necessarily comprise part of the Payment.

For the purposes of describing two specific Index Mortgage product constructions the terms Index Amount (in relation to Regular Mortgage Payments) and Negative Advance (in relation to Ad Hoc Payments) are used, in each case these terms refer to Index.

Index Loan

A loan whose repayments made by the borrower to a lender can be linked to one or more Price Indices.

Index Mortgage

A specific type of Index Loan where the loan is secured and specifically secured against specific property, land or building. Index Repayment Mortgage is the same as Index Mortgage.

Index Repaid and Index Bonus

The terms Index Repaid and Index Bonus are both the value of Assets, but in each case relating to a specific product construction of an Index Mortgage and, in particular, a specific construction of both exposure to Price Indices and amount of a Regular Mortgage Payment that is allocated as Index (and hence exposed to future Price Index movements).

Liabilities (Liability)

A Liability or Liabilities can only be created by the existence of an Index Loan and comprise the amount needed at any time in order to repay or redeem the Index Loan.

The value of Liabilities at any time comprises the current Total Borrowings plus any Outstanding Interest plus any Redemption Penalities.

Net Assets

This is the value of Assets less the value of Liabilities.

Net Liabilities

This is the value of Liabilities less the value of Assets.

Net Position

This is either Net Assets or Net Liabilities.

Outstanding Interest

Outstanding Interest is simply Accrued Interest less Paid Interest.

Paid Interest

Paid Interest is the amount of Payments made by the borrower to the lender that have been allocated towards the payment of interest. It is assumed that Paid Interest can never exceed Accrued Interest.

Payments

These are amounts paid by the borrower to the lender under an Index Loan and can either be made on a regular basis and/or one off. Regular payments under an Index Mortgage are called Regular Mortgage Payments and one off payments made under an Index Mortgage are called Ad Hoc Payments.

Payments must be allocated to a combination of up to three elements: Paid Interest, Repaid Borrowing and Index.

Positive Advance

This is a payment from the lender to the borrower but is not a Borrowing, instead the value of Assets is reduced by the amount of the payment. The borrower may request that such payment is instead allocated as a Repaid Borrowing, thus reducing Liabilities.

Price Index (and Price Indices)

An index of prices where such prices are the price of a commodity, share or any other type of asset or any index of prices, or derivative on, such assets, or a combination thereof. More than one Price Index is referred to as Price Indices.

Price Index Value

The current value of Assets.

Redemption Penalties

These are the penalties, if any, that may apply upon any Repaid Borrowing from time to time.

Repaid Borrowings

The cumulative total of all capital (or principal) repaid to the lender by the borrower to date under any one Index Loan is called Repaid Borrowings (with each individual repayment called a Repaid Borrowing).

Note that a borrower may request that the value of Assets relating to his Index Loan is reduced by some amount and that this amount be applied as a Repaid Borrowing although this does not affect the Net Position.

Review

This is a process under which the level of Payments being made by the borrower is compared to any Net Position level objective at some future date, the result of which may be to recommend or require a borrower to alter his planned level of future Payments, or adjust intended future Payment dates, or adjust Price Index links applying to the current Assets or adjust the Price Index links intended to apply to future Index allocations, or any combination thereof. Although a Review is not a mandatory requirement of operating an Index Loan it is difficult to see why in practice a lender would not carry them out from time to time.

Review Basis

This is the set of data and assumptions used in order to carry out a Review. Such data and assumptions include a future Net Position target level, a date that such target level applies at, the current value of Assets, the current Total Borrowings, current Outstanding Interest, future Redemption Penalties, future Payment amounts, their frequency and Index allocations, Gearing and future Price Index growth rates.

Total Borrowings

Total Borrowings at any time is the cumulative total of

all capital (or principal) borrowed by the borrower from the lender to date under any one Index Loan less the cumulative total of all repayments of capital (or principal). This is Borrowings less Repaid Borrowings. An example of a standard repayment mortgage is given and the term Capital Balance Outstanding is used, this is Total Borrowings.

Note that a borrower may request that the value of Assets relating to his Index Loan is reduced by some amount and that this amount be paid by the lender to the borrower, this does affect the Net Position, but does not affect Borrowings or Total Borrowings.

For the purposes of describing two possible constructions of an Index Mortgage the term Positive Advance is used and this refers to this case where the borrower requests that the value of Assets be reduced and the amount be paid by the lender to the borrower.

CLAIMS:

1. A computer system for managing Net Position, Assets and Liabilities, the system comprising:

an input unit, a memory unit, a display unit and a digital processing unit, wherein said memory unit includes:

a liability file having a plurality of storage areas for storing the amounts of a plurality of Liabilities in response to user input;

a liability interest rate file having a plurality of areas for storing in response to user input present and, if different, past interest rates applicable to said Liabilities;

an accrued interest file having a plurality of storage areas for storing data relating to the amounts of interest accrued on each of said Liabilities;

a paid interest file having a plurality of storage areas for storing data relating to amounts and dates of any interest paid in respect of individual ones of said

Liabilities;

a payment file having a plurality of storage areas for storing data relating to payments made that create exposure to a Price Index, each payment being related to one of said Liabilities;

a Price Index file having a plurality of storage areas for storing in response to user input data identifying at least one Price Index;

a Price Index exposure file having a plurality of storage areas for storing user input data defining the degree of exposure of a payment to a selected Price Index;

a Price Index price file having a plurality of storage areas for storing in response to user input the data relating to the historic prices of the or each one of said Price Indices stored in said Price Index file;

a Price Index transactions file having a plurality of storage areas for storing data relating to the amount of transactions that create or reduce exposure to any Price Index where such transactions are in respect of a particular one of said Liabilities, the date of the

transaction; and

a Review Basis file having a plurality of storage areas for storing in response to user input data defining the assumptions made with regard to the future performance of the or each of said Price Indices; and

wherein said digital processing unit comprises first processing means for calculating the total amount of each Liability from data stored in said liability file;

second processor means for calculating accrued interest for each Liability from data stored in said accrued interest file;

third processor means for calculating the value of transaction linked to a Price Index and associated with a Liability in response to data stored in said Price Index price file and said Price Index transactions file;

fourth processor means for calculating for each Liability the actual Net Liability from data stored in said Liability file said accrued interest file, said paid interest file, said payment file and said Price Index transaction file;

fifth processor means for reading in response to an output command entered through said input unit, data generated by said fourth processor means; and

sixth processor means for generating in response to an output command a display of the Net Liability situation of a selected Liability and its associated Assets.

2. A system according to claim 1, wherein said fourth processor means are adapted to calculate for any particular liability from data in said accrued interest file, said paid interest file, said payment file, said Price Index file, said Price Index Transaction file and the Review Basis file, a future Net Liability situation for said particular liability on the basis of both the actual variations in the Price Index or Price Indices to which the payment stored in said payment file, and on the basis for the assumption of Price Index behaviour stored in said review basis file.

3. A system according to claim 1 or claim 2, wherein said fourth processor means is in response to a control program to calculate from the data in the first data base the amount of the liability ($_tIR$) deemed to have been repaid at a time t from the start of the mortgage by said

payments in accordance with the formula

$_tIR$ =

$$\sum_{i=1}^{t}\sum_{j=1}^{x}\left\{{}_iIA\,x\,{}_iPI/{}_iPI_j\right\}+\left\{{}_iAHNA_j\,x\,{}_iPI_j/{}_iPI_j\right\}$$

where $_iIA_j$, = the amount of a payment made at time i which has been linked to a Price Index j;

$_iAHNA_j$ = the element of an Ad Hoc Negative Advance made at time i that has been exposed to Price Index j;

$_iPI_j$ = the price of Price Index j at time i;

X = the total number of Price Indices;

and to store $_tIR$ in said liability file.

4. A system according to claim 3, wherein said fourth processor means is adapted to calculate

$_tIR$ =

$$\sum_{i=1}^{t}\sum_{j=1}^{x}\left\{{}_iIA_j\,x\,{}_iPI_j/{}_iPI_j\right\}+\left\{{}_iAHNA_j\,x\,{}_iPI_j/{}_iPI_j\right\}-\left\{{}_iPA_j\,x\,{}_iPI_j/{}_iPI_j\right\}$$

where $_iPA_j$ = a positive advance made at time i which is exposed to the Price Index j.

5. A system according to claim 3 or claim 4 wherein said

processor is adapted to calculate regular payments ($_tRMP$) due from the borrower potentially sufficient over the period (N) of the mortgage to repay the interest due and the capital balance, and to calculate for selected amounts of selected ones of said regular payments an accumulation factor for the selected amount derived from an assumed growth rate ($_tG$) of the Price Index (PI).

6. A system according to claim 5, wherein said processor is adapted to calculate from data comprising $_tINT$, the interest rate that applies to the Index Loan, for period t-1 and t, the period N, the frequency (FP) of regular payments and an Index Amount ($_tIA$) which is the portion of the ($_tRMP$) to be exposed to the Price Index (PI) and the future growth rate of the Price Index assumed at time t, which growth rate is given by ($_tG$).

7. A system according to claim 4 or claim 5, wherein the form processor means is adapted to calculate in response to a control program the Index Amount $_tIA$ representing the element of $_tRMP$ due at time t to be exposed to the movement of the Price Index (PI) in accordance with the equation

$$_{t+1}IA = \left({}_tTB - {}_tIR\, x \left[\left(1 + {}_tG \right)^{\wedge} \left(N\, x\, FP - t \right) \right] \right) / S_{(N-t)}$$

where $_tG$ = Price Index growth rate during one FP period assumed at time t to apply for each such period from t to N, and $S_{(N-t)}$ is the accumulation factor.

8. A system according to claim 7, wherein said processor means is adapted to calculate the accumulation factor $S_{(N-t)}$ in accordance with the equation

$$S_{(N-t)} = \left\{\left[\left(1+{}_tG\right)\text{^}\left(N\,x\,FP-t\right)\right]-1\right\}/{}_tG$$

9. A system according to any one of claims 3, 4, 5, or 6 wherein said processor is adapted to calculate in response to a control program the interest cost element ($_tI$) of $_tRMP$ due at time t in accordance with the equation

$${}_{t+1}I = \left\{\left[\left(1+{}_{t+1}INT\right)\text{^}(1/FP)\right]-1\right\} x\ {}_tTB,$$

where

$${}_tTB = \sum_{i=0}^{t} {}_iB - {}_iRB$$

$_tTB$ = Total Borrowings (cumulative) at time t,

$_tB$ = a Borrowing made at time t by the Lender, and

$_tRB$ = a Repaid Borrowing made at time t by the Borrower.

10. A system according to any preceding claim, wherein said fourth processor means is adapted to calculate

$$_tRA = \sum_{i=1}^{t} \left\{ \left[{}_iB - {}_iAHRB - {}_iRMP + {}_iPA - {}_iAHNA \right] X \left[\prod_{j=i+1}^{t} \left(1 + {}_jINT \right)^{\Lambda (1/FP)} \right] \right\}$$

where AHRB represents an Ad Hoc Payment allocated to a

$$_tRA_2 = \sum_{i=1}^{t} \left\{ \left[{}_iB - {}_iAHRB - {}_iRMP + {}_iPA - {}_iAHNA \right] X \left[\prod_{j=i+1}^{t} \left(1 + {}_jINT_2 \right)^{\Lambda (1/FP)} \right] \right\}$$

Repaid Borrowing by the borrower, and

AHNA represents an Ad Hoc Negative Payment allocated to a Negative Advance by the borrower, to calculate

where $_jINT_2 = INT_2$ for all j, and to solve for the value of INT_2 that would cause $_tRA_2$ to equal $_tTB - {}_tIR$.

11. A system according to any preceding claim, wherein

said fourth processor means is adapted to calculate a $_{t}G$ potentially different from $_{t-1}G$ from the history of prices of the Price Index stored in said Price Index price file and the history of stored interest rates stored in said liability interest file.

12. A system according to claim 10, and wherein said fourth processor means is adapted to calculate at a selected time t during the period N the current value of $_{t+1}IA$ and to compare the actual growth rate of the Price Index with the assumed growth rate ($_{t}G$) and to compare $_{t}IR$ with the planned value of the same so as to generate data indicating whether or not a change has to be made to $_{t}G$ for the subsequent period of the mortgage, and to recalculate a new value of $_{t+1}IA$.

13. A system according to any one of the preceding claims, where said fourth processor means is adapted to compare $_{t}TB$ plus accumulated unpaid interest to $_{t}IR$ and to generate an alert to cause the Index Loan to be redeemed when $_{t}IR$ is greater than or equal to $_{t}TB$ plus accumulated unpaid interest.

14. A system according to any one of the preceding claims and comprising a Total Liability data base having

a plurality of storage areas for storing data representing the assets held by a lender for the purpose of matching appropriate Price Index exposure, and wherein including seventh processor means adapted to sum for all Index Loans the current Index Repaid value for the or each Price Index.

15. A computer system according to any preceding claim and including at least one remote terminal having a central processor, a display device, a memory unit and a display unit, and wherein said remote terminal has an interface circuit adapted to interface with the computer system whereby a command entered at the input means of said terminal generates a selective display on said display unit of the Net Position, Assets and Liabilities of a borrower.

16. A method of operating a computer system, the system comprising:

an input unit, a memory unit, a display unit and a digital processing unit for management of Net Position, Assets and Liabilities of a plurality of borrowers, comprising the steps of providing said memory unit with:

a liability file having a plurality of storage areas for storing the amounts of a plurality of Liabilities in response to user input;

a liability interest rate file having a plurality of areas for storing in response to user input present and, if different, past interest rates applicable to said Liabilities;

an accrued interest file having a plurality of storage areas for storing data relating to the amounts of interest accrued on each of said Liabilities;

a paid interest file having a plurality of storage areas for storing data relating to amounts and dates of any interest paid in respect of individual ones of said Liabilities;

a payment file having a plurality of storage areas for storing data relating to payments made that create exposure to a Price Index, each payment being related to one of said Liabilities;

a Price Index file having a plurality of storage areas for storing in response to user input data identifying

at least one Price Index;

a Price Index exposure file having a plurality of storage areas for storing user input data defining the degree of exposure of a payment to a selected Price Index;

a Price Index price file having a plurality of storage areas for storing in response to user input the data relating to the historic prices of the or each one of said Price Indices stored in said Price Index file;

a Price Index transactions file having a plurality of storage areas for storing data relating to the amount of transactions that create or reduce exposure to any Price Index where such transactions are in respect of a particular one of said Liabilities, the date of the transaction; and

a Review Basis file having a plurality of storage areas for storing in response to user input data defining the assumptions made with regard to the future performance of the or each of said Price Indices; and

wherein said digital processing unit comprises first processing means for calculating the total amount of each Liability from data stored in said liability file;

and selectively providing on the display unit a display of the Net Position, Assets and Liabilities of a borrower by calculating accrued interest for each Liability from data stored in said accrued interest file;

calculating the value of transaction linked to a Price Index and associated with a Liability in response to data stored in said Price Index price file and said Price Index transactions file;

calculating for each Liability the actual Net Liability from data stored in said Liability file said accrued interest file, said paid interest file, said payment file and said Price Index transaction file;

reading in response to an output command entered through said input unit, data generated by said fourth processor means; and

generating in response to an output command a display of the Net Liability situation of a selected Liability and its associated Assets.

17. A method according to claim 16, including calculating for any particular liability from data in

said accrued interest file, said paid interest file, said payment file, said Price Index file, said Price Index Transaction file and the Review Basis file, a future Net Liability situation for said particular liability on the basis of both the actual variations in the Price Index or Price Indices to which the payment stored in said payment file, and on the basis for the assumption of Price Index behaviour stored in said review basis file, in response to an input command display the future Net Liability situation on said display unit.

18. A storage medium storing processor implementable instructions for controlling a processor to carry out the method of either of claims 16 or 17.

19. An electrical signal carrying processor implementable instructions for controlling a processor to carry out the method of either of claims 16 or 17.

FIGURE 1 -

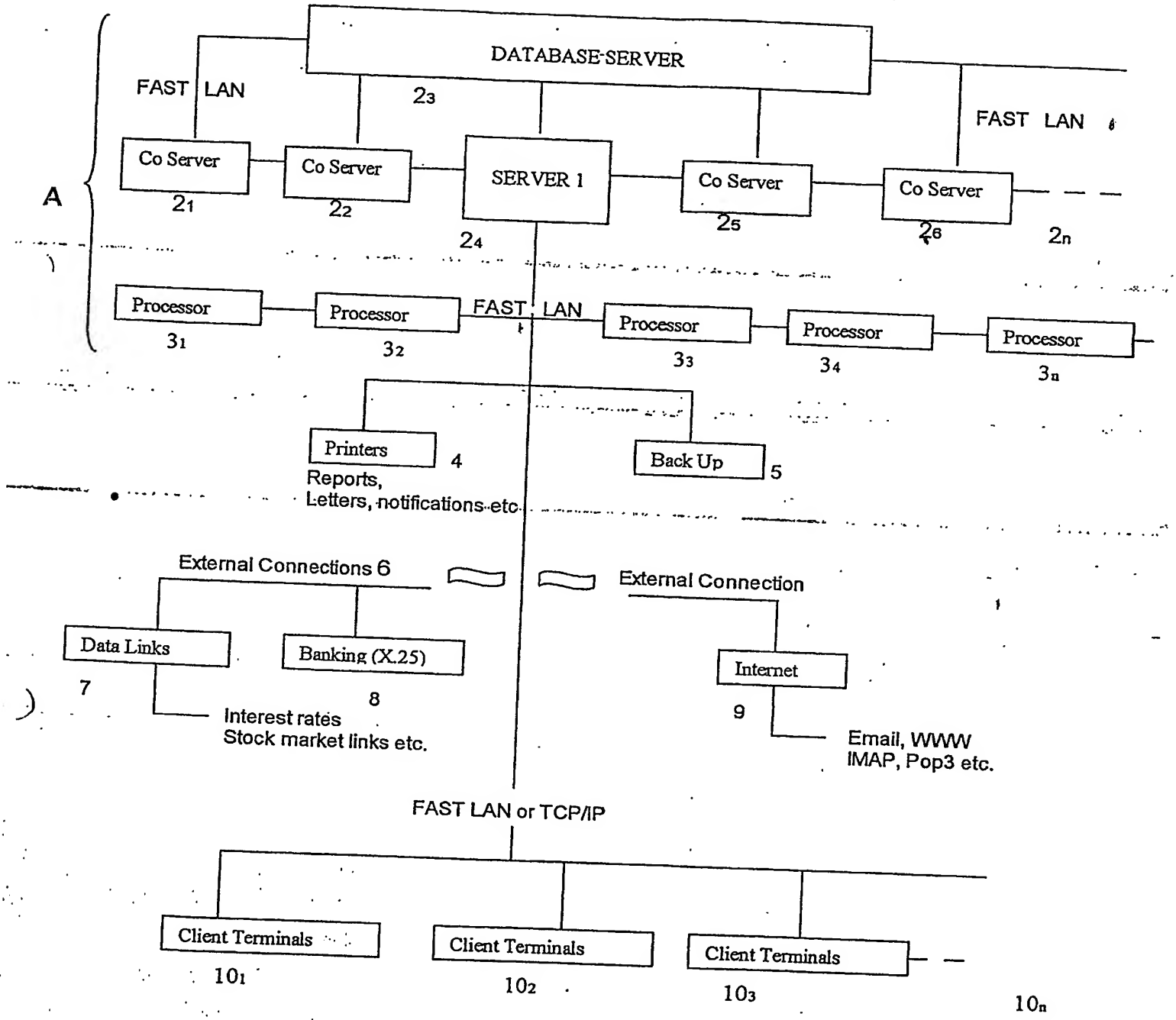

A
DATABASE SERVER
FAST LAN
23
FAST LAN
Co Server
21
Co Server
22
SERVER 1
24
Co Server
25
Co Server
26
2n
Processor
31
Processor
32
FAST LAN
Processor
33
Processor
34
Processor
3n
Printers
4
Reports,
Letters, notifications etc.
Back Up
5
External Connections 6
External Connection
Data Links
7
Interest rates
Stock market links etc.
Banking (X.25)
8
Internet
9
Email, WWW
IMAP, Pop3 etc.
FAST LAN or TCP/IP
Client Terminals
101
Client Terminals
102
Client Terminals
103
10n

FIGURE 2

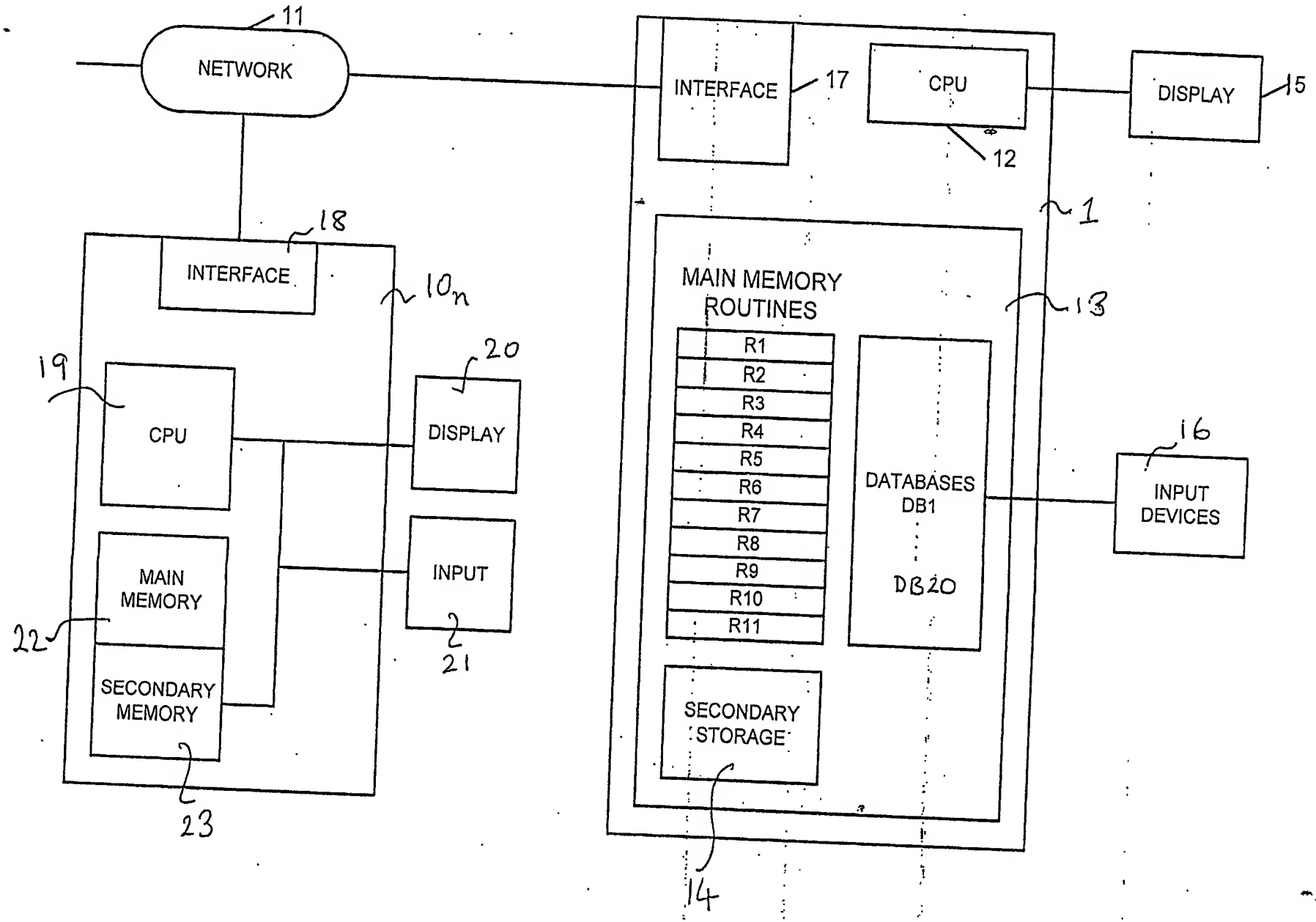

11
NETWORK
INTERFACE
17
CPU
12
DISPLAY
15
1
18
INTERFACE
10n
MAIN MEMORY ROUTINES
13
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
DATABASES DB1
DB20
16
INPUT DEVICES
19
CPU
20
DISPLAY
INPUT
21
MAIN MEMORY
22
SECONDARY MEMORY
23
SECONDARY STORAGE
14

FIGURE 3

OVERVIEW OF COMPUTER SYSTEM SOFTWARE

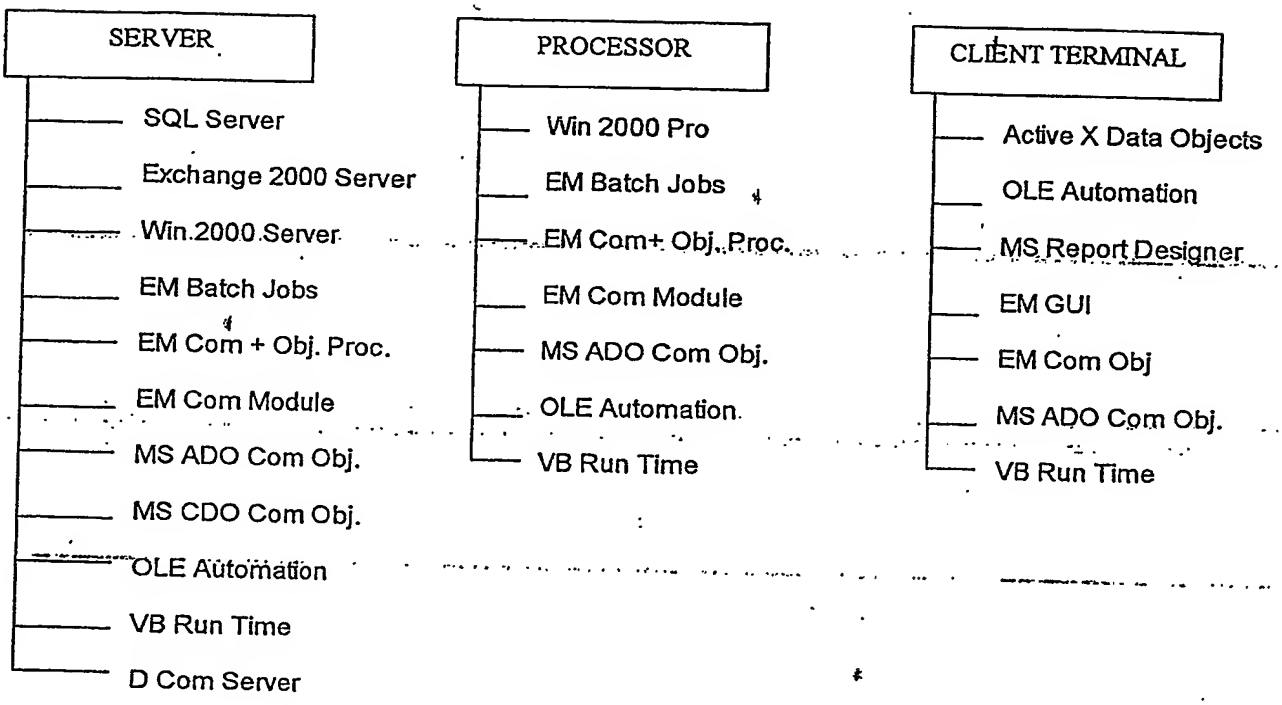


FIGURE 4A

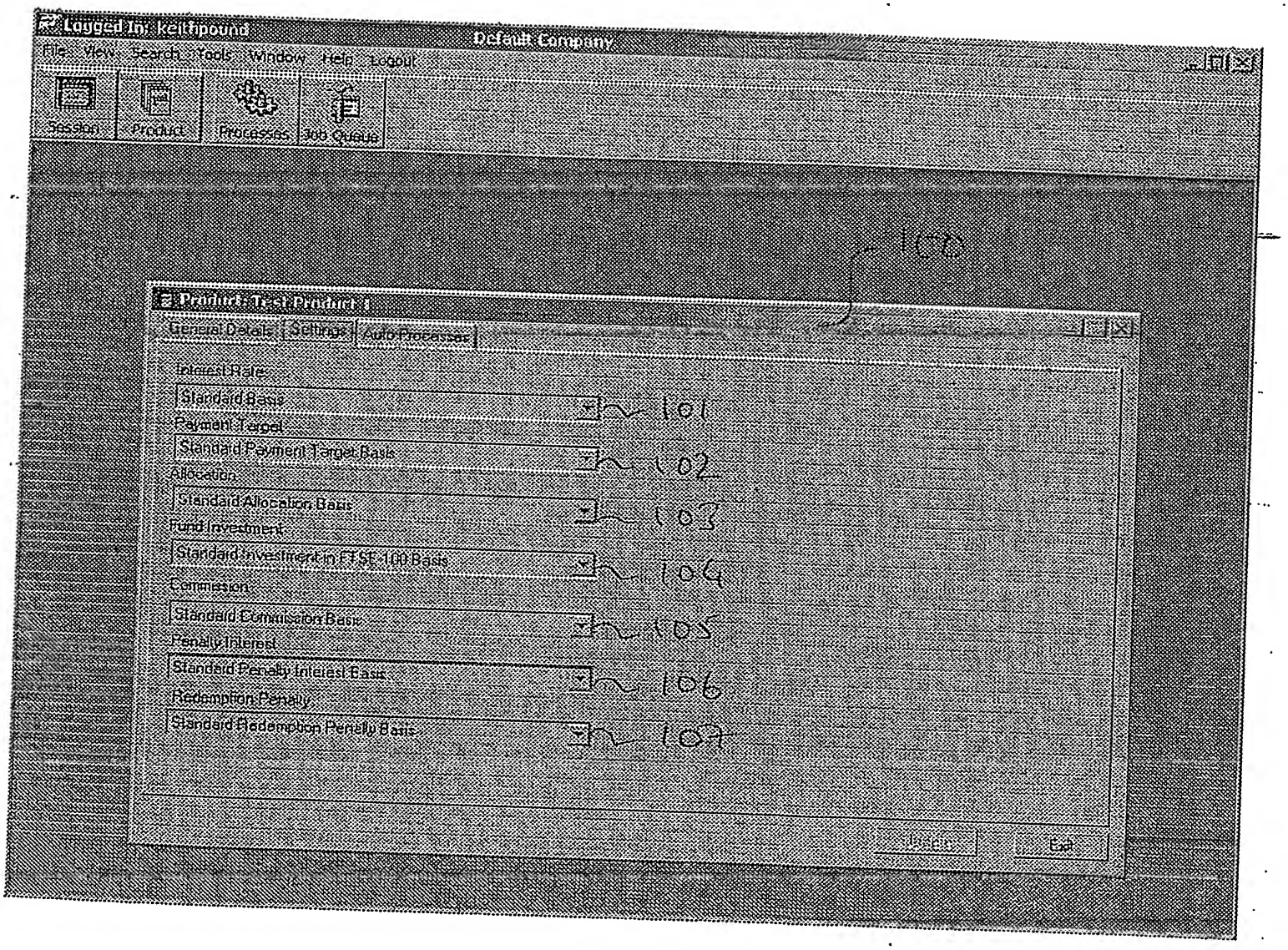
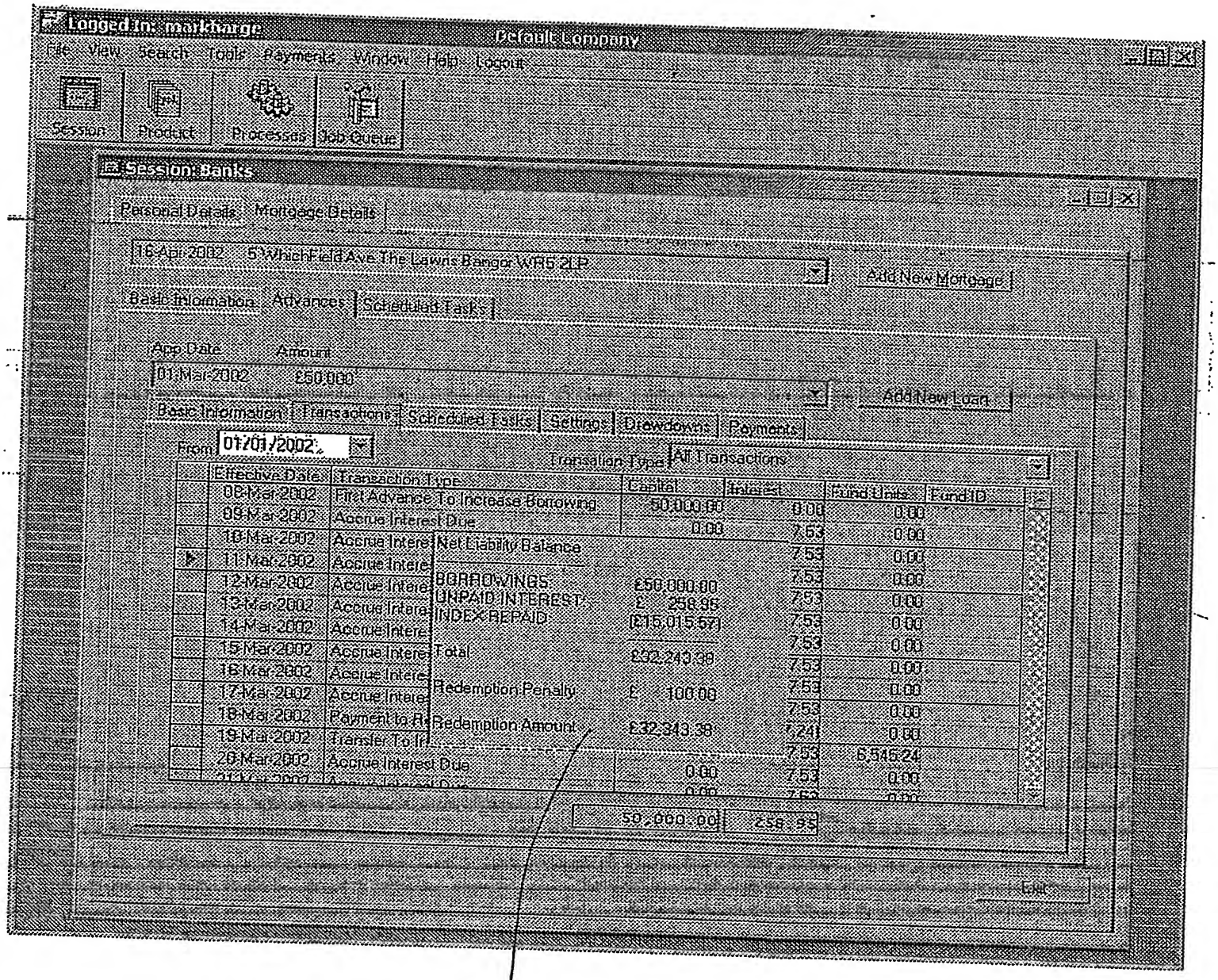

Logged In: KeithPound
Default Company
File View Search Tools Window Help Logout
Session
Product
Processes
Job Queue
Product: Test Product 1
General Details
Settings
Auto Processes
Interest Rate
Standard Basis
Payment Target
Standard Payment Target Basis
Allocation
Standard Allocation Basis
Fund Investment
Standard Investment in FTSE 100 Basis
Commission
Standard Commission Basis
Penalty Interest
Standard Penalty Interest Basis
Redemption Penalty
Standard Redemption Penalty Basis
Update
Exit
100
101
102
103
104
105
106
107

FIGURE 4B



110

FIGURE 5

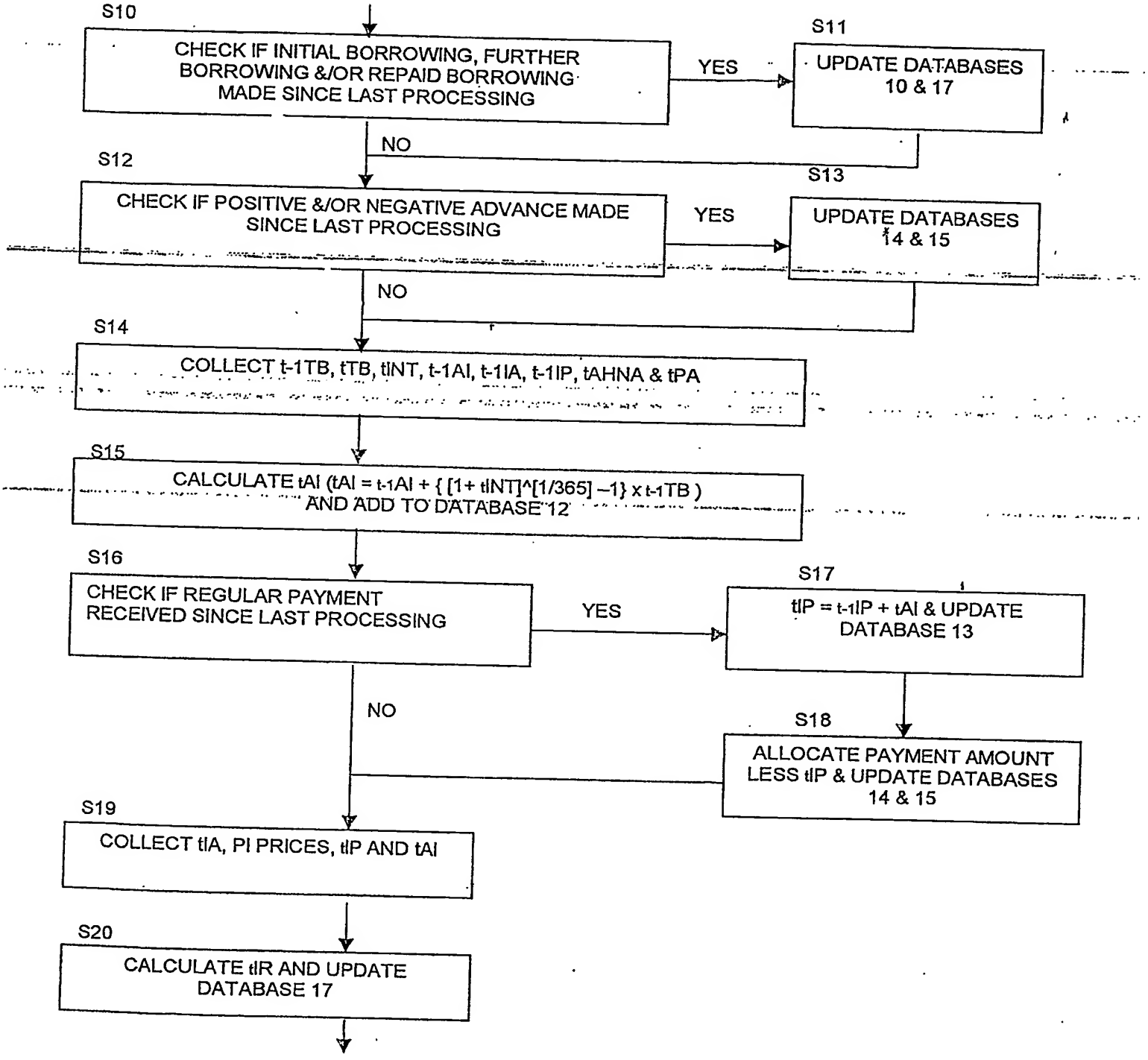
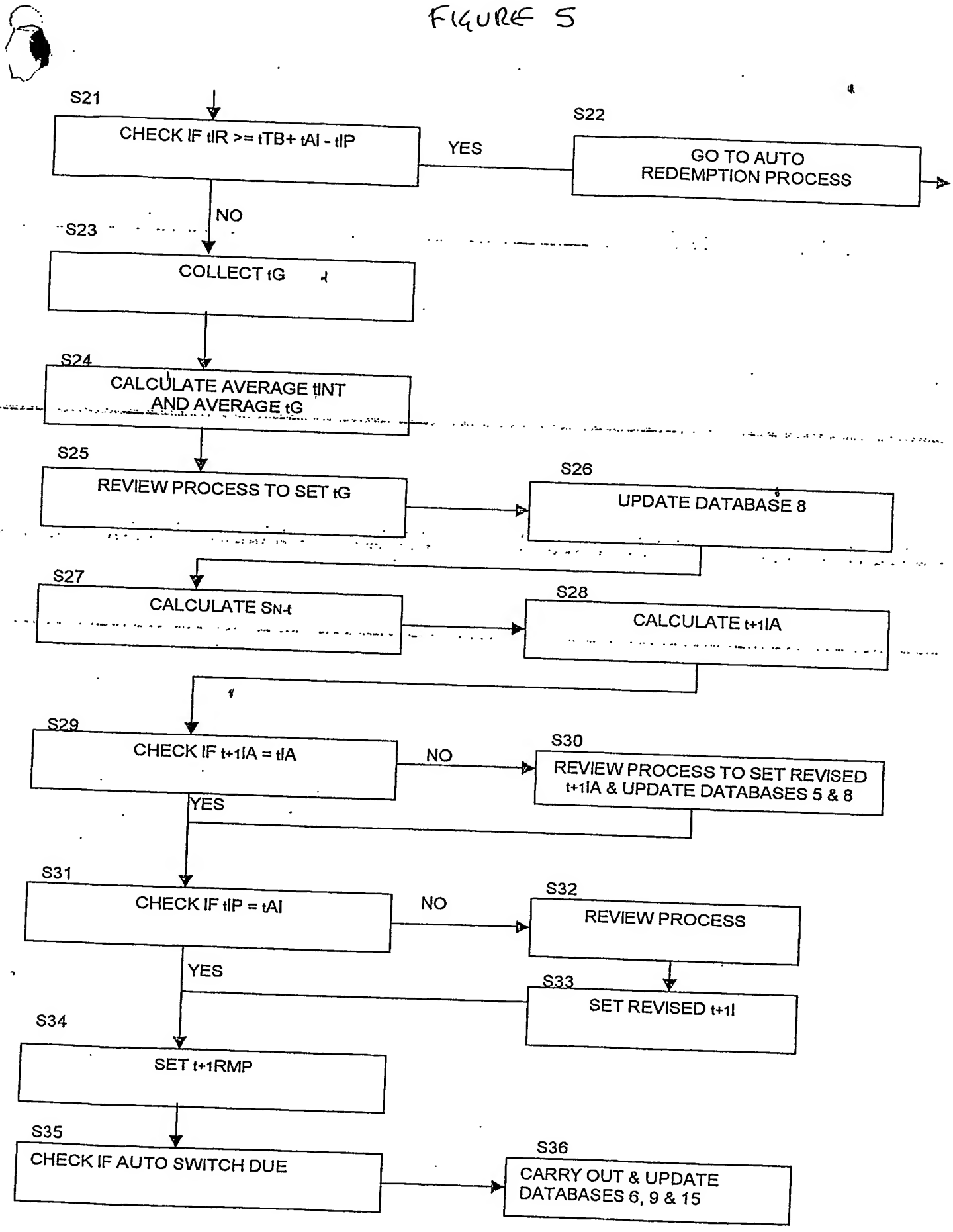

S10
CHECK IF INITIAL BORROWING, FURTHER BORROWING &/OR REPAID BORROWING MADE SINCE LAST PROCESSING
YES
S11
UPDATE DATABASES 10 & 17
NO
S12
CHECK IF POSITIVE &/OR NEGATIVE ADVANCE MADE SINCE LAST PROCESSING
YES
S13
UPDATE DATABASES 14 & 15
NO
S14
COLLECT t-1TB, tTB, tINT, t-1AI, t-1IA, t-1IP, tAHNA & tPA
S15
CALCULATE tAI (tAI = t-1AI + { [1+ tINT]^[1/365] –1} x t-1TB) AND ADD TO DATABASE 12
S16
CHECK IF REGULAR PAYMENT RECEIVED SINCE LAST PROCESSING
YES
S17
tIP = t-1IP + tAI & UPDATE DATABASE 13
NO
S18
ALLOCATE PAYMENT AMOUNT LESS tIP & UPDATE DATABASES 14 & 15
S19
COLLECT tIA, PI PRICES, tIP AND tAI
S20
CALCULATE tIR AND UPDATE DATABASE 17

FIGURE 5


S21
CHECK IF tIR >= tTB+ tAI - tIP
YES
S22
GO TO AUTO REDEMPTION PROCESS
NO
S23
COLLECT tG
S24
CALCULATE AVERAGE tINT AND AVERAGE tG
S25
REVIEW PROCESS TO SET tG
S26
UPDATE DATABASE 8
S27
CALCULATE SN-t
S28
CALCULATE t+1IA
S29
CHECK IF t+1IA = tIA
NO
S30
REVIEW PROCESS TO SET REVISED t+1IA & UPDATE DATABASES 5 & 8
YES
S31
CHECK IF tIP = tAI
NO
S32
REVIEW PROCESS
YES
S33
SET REVISED t+1I
S34
SET t+1RMP
S35
CHECK IF AUTO SWITCH DUE
S36
CARRY OUT & UPDATE DATABASES 6, 9 & 15